gas-phase reactive halide composition comprising XeF_2 and at least one cleaning enhancement agent selected from the group consisting of carbon monoxide, trifluorophosopiline, and trialkylphosphines, to form at least one iridium halide species.

REMARKS

Claims 2-4, 12-14, 24-27, 53 and 57-58 are pending in the instant application.

Information Disclosure Statement

In the December 7, 2001 Office Action, the Examiner requested that applicant submit all non-patent references cited in applicant's January 24, 2001 Information Disclosure Statement in the above referenced patent application. In response, applicant submits herein, in Appendix C, a copy of all non-patent references cited in the January 24, 2001 Information Disclosure Statement.

Claims Objection Under 37 CFR §1.126

In the December 7, 2001 Office Action, the Examiner objected to the numbering of claims as not in accordance with 37 CFR §1.126 and as such, renumbered applicant's claims 1-47, 49-51, and 48-53 as 1-50 and 51-56 respectively. Applicant acknowledges such renumbering and confirms the pending claims in this application as 2-4, 12-14, 23-27 and 51-56.

Claim Rejection Under 35 USC §112, First Paragraph

In the December 7, 2001 Office Action, claim 56 was rejected under 35 USC §112, first paragraph, because the limitation – "lacking a nitrogen – or phosphorous-containing - acceptor ligand" is not supported by the original disclosure of 09/093,291, to which this application claims priority.

In response, applicant cancels herein, claim 56, without prejudice and as such, applicant respectfully requests the examiner withdraw the rejection under 35 USC §112, first paragraph.

Claims Rejection Under 35 USC §112, Second Paragraph

In the December 7, 2001 Office Action, claims 2-4, 12-14 and 23-27 were rejected under 35 USC §112, second paragraph, because there is insufficient antecedent basis for the dependencies of such claims.

In response, applicant adds independent claim 57, amends claims 2-4, 12-14 and 24 and cancels claim 23. Claim 57 provides antecedent basis for claims 2-4, 12-14 and 24-27 and the amendment to claims 2-4, 12-13 and 24 corrects the dependency of such claims from a cancelled claim (1) to a base claim 57. Such amendments introduce no new subject matter.

On the basis of the foregoing, claims 2-4, 12-14 and 23-27 as amended are in accordance with 35 USC §112, second paragraph and as such applicant respectfully requests the Examiner withdraw the rejection of claims 2-4, 12-14 and 23-27 under 35 USC §112, second paragraph.

Double Patenting Rejection Based on 35 USC §101

In the December 7, 2001 Office Action, claim 52 was rejected under 35 USC §101 as claiming the same invention as that of claim 35 of U.S. Patent No. [sic] 6,254,792.

In response, applicant cancels herein, claim 52, without prejudice. Accordingly, applicant respectfully requests, the rejection of claim 52 under 35 USC §101 be withdrawn.

Non-Statutory Double Patenting Rejection

In the December 7, 2001 Office Action, claim 51 was rejected under the judicially created doctrine of obviousness-type double patenting and claims 54 and 55 were provisionally rejected under the judicially created doctrine of obviousness–type double patenting.

In response, applicant cancels herein, claims 51, 54 and 55, without prejudice. Accordingly, applicant respectfully requests, the rejection of such claims, under the judicially created doctrine of obviousness-type double patenting be withdrawn.

Claim Rejections Under 35 USC §103(a)

In the December 7, 2001 Office Action, claims 54 and 56 were rejected under 35 USC §103(a) as being unpatentable over U.S. Patent 5,854,104 issued to Onishi et al., and claim 56 was further rejected under 35 USC §103(a) as being unpatentable over U.S. Patent 5,492,855 issued to Matsumoto et al.

Applicants have cancelled herein claims 54 and 56 without prejudice. Accordingly, applicants respectfully request the rejections based on 35 USC 103(a) be withdrawn.

Allowable Subject Matter

Applicant acknowledges the allowance of claim 53 in the December 7, 2001 Office Action .

Fees Payable

By the addition of independent claims 57 and 58, applicant has not exceeded the number of independent claims for which payment was originally made. Nevertheless, if any fee or charge is deemed properly payable in connection with the entry of this amendment, the United States Patent and Trademark Office is hereby authorized to charge any payment necessary to Deposit Account No. 50-0860 in the name of Advanced Technology Materials, Inc.

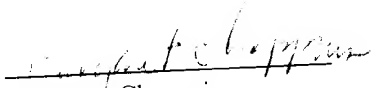
CONCLUSION

The pending claims 2-4, 12-14, 24-27, 53 and 57-58 patentably distinguish over the prior art, and in the forgoing remarks all rejections have been overcome. The application, therefore, is in condition for allowance. Notice of the same is earnestly solicited.

In the event that any issues remain, Examiner Olsen is requested to contact the undersigned agent at (203)794-1100 extension 4184, to resolve same.

Date: March 6, 2002

Respectfully submitted,



Margaret Chappuis
Agent for Applicant
Registration No. 45,735

Advanced Technology Materials Inc.
7 Commerce Drive
Danbury CT 06810
Telephone (203) 794-1100 ext 4184
Facsimile (203) 797-2544
Docket No. ATMI 272CON

APPENDIX A

MARKED-UP VERSION OF CLAIMS IN UNITED STATES PATENT APPLICATION NO. 09/768,494

2. (amended) The method according to claim [1] 57, wherein the reactive halide composition comprises XeF_2.

3. (amended) The method according to claim [1] 57, wherein the reactive halide composition is selected from the group consisting of SF_6, SiF_4, and Si_2F_6.

4. (amended) The method according to claim [1] 57, wherein the reactive halide composition is selected from the group consisting of SiF_2 and SiF_3 radicals.

12. (amended) The method according to claim [1] 57, wherein the gas-phase reactive halide composition is selected from the group consisting of SiF_2 and SiF_3 radicals and the reactive halide composition is generated by reaction of XeF_2 with silicon.

13. (amended) The method according to claim [1] 57, wherein the gas-phase reactive halide composition is selected from the group consisting of SiF_2 and SiF_3 radicals and the reactive halide composition is generated by passing SiF_4 through an energetic dissociation source.

14. The method according to claim 13, wherein the energetic dissociation source is selected from the group consisting of a plasma source, an ion source, an ultra violet source and a laser source.

~~23. The method according to claim 22 wherein the cleaning enhancement agent comprises an iridium halide species selected from the group consisting of $Ir(X)_1$, $Ir(X)_3$, $Ir(X)_4$ and $Ir(X)_6$, wherein X represents the halide of the reactive halide composition.~~

24. (amended) The method according to claim [19] 57, wherein the [cleaning gas further comprising a] noble metal residue comprises iridium, and the cleaning gas comprises XeF_2 and at least one gas phase reactive halide species selected from the group consisting of SF_6, SiF_4, Si_2F_6 and SiF_2 and SiF_3 radicals and the microelectronic device structure, is further contacted with a cleaning enhancement agent.

25. The method according to claim 24, wherein the cleaning enhancement agent is selected from the group consisting of Lewis-base adducts and electron back-bonding species.

26. The method according to claim 24, wherein the cleaning enhancement agent is selected from the group consisting of carbon monoxide, trifluorophosphine, and trialkylphosphines.

27. The method according to claim 24 wherein the cleaning enhancement agent comprises an iridium halide species from the group consisting of $Ir(X)_1$, $Ir(X)_3$, $Ir(X)_4$ and $Ir(X)_6$, wherein X represents the halide of the reactive halide composition.

~~51. A method for removing a noble metal residue comprising iridium, from a microelectronic device structure disposed in a chamber, the method comprising contacting the microelectronic device structure with a cleaning gas comprising gas-phase XeF_2, wherein the gas-phase XeF_2 is continually flowed through the chamber in combination with an energetic dissociation source selected from the group consisting of a plasma source, an ion source, an ultra violet source and a laser source, to at least partially remove the noble metal residue.~~

~~52. A method for removing a noble metal residue comprising iridium, from a microelectronic device structure disposed in a chamber, wherein elemental silicon is present, the method comprising evacuating the chamber, filling the chamber with a cleaning gas comprising XeF_2, and retaining the cleaning gas in the chamber to react with the residue, to effect the removal of the noble metal residue from the microelectronic device structure.~~

53. A method for removing a noble metal residue comprising iridium, from a microelectronic device structure disposed in a chamber, the method comprising evacuating the chamber, filling the chamber with a cleaning gas comprising XeF_2 and one or more radicals selected from the group consisting of SiF_2 and SiF_3, and retaining the cleaning gas in the chamber to react with the residue, to effect the removal of the noble metal residue from the microelectronic device structure.

~~54. A method for removing from a microelectronic device structure a noble metal residue including at least one metal selected from the group consisting of platinum, palladium,~~

~~iridium and rhodium, the method comprising contacting the microelectronic device structure with a gas-phase reactive halide composition comprising SiF_4, to remove the residue.~~

~~55. A method for removing from a microelectronic device structure a noble metal residue including at least one metal selected from the group consisting of platinum, palladium, iridium and rhodium, the method comprising contacting the microelectronic device structure with a gas-phase reactive halide composition comprising Si_2F_6, to remove the residue.~~

~~56. A method for removing from a microelectronic device structure a noble metal residue including at least one metal selected from the group consisting of platinum, palladium, iridium and rhodium, the method comprising contacting the microelectronic device structure with a gas-phase reactive halide composition:~~

~~(a) comprising a halide component selected from the group consisting of SF_6, SiF_4, Si_2F_6, SiF_2 radical, SiF_3 radical, and XeF_2, in an amount effective to a least partially remove the residue; and~~

~~(b) lacking a nitrogen- or phosphorous-containing π-acceptor ligand.~~

The following claims have been added:

57. (new) A method for removing from a microelectronic device structure a noble metal residue including at least one metal selected from the group consisting of platinum, palladium, iridium and rhodium, the method comprising contacting the microelectronic device structure with a gas-phase reactive halide composition to remove the residue.

58. (new) A method for removing from a microelectronic device structure, a noble metal residue comprising iridium said method comprising, contacting the microelectronic device structure with a gas-phase reactive halide composition comprising XeF_2 and at least one cleaning enhancement agent selected from the group consisting of carbon monoxide, trifluorophosopiline, and trialkylphosphines, to form at least one iridium halide species.